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Forage and Weed Species and Grazing Management Systems on Permanent Pastures in the Allegheny Highlands of West Virginia

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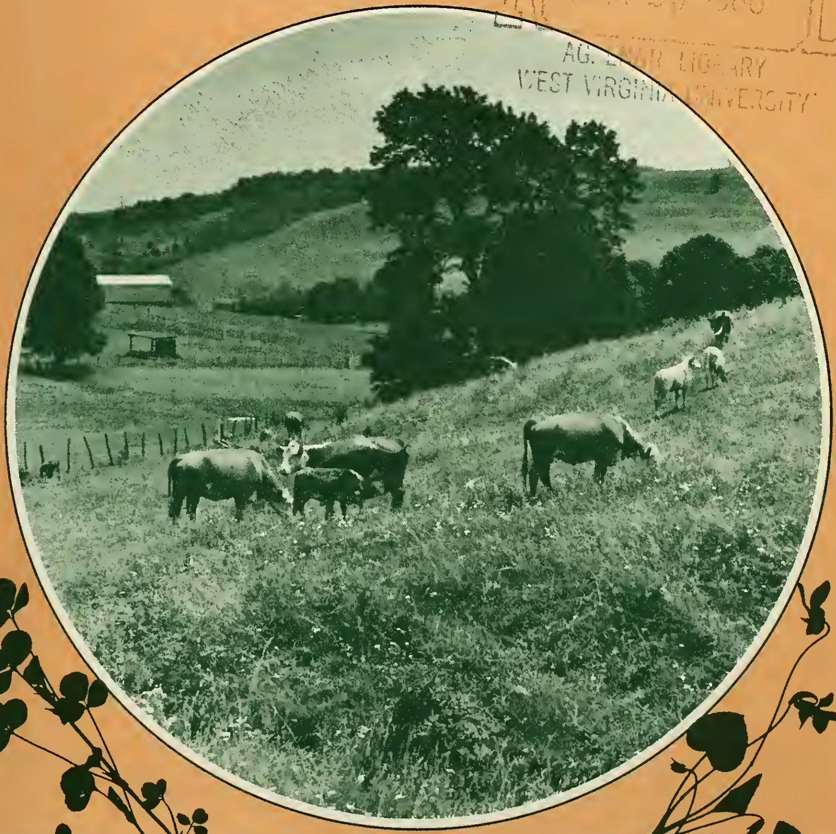

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Forage and Weed Species and Grazing Management Systems on Permanent Pastures in the Allegheny Highlands of West Virginia

Barton S. Baker and Roger L. Nestor

West Virginia's agriculture depends heavily on permanent pastures to support its livestock industry, yet pastures are frequently neglected. A survey of West Virginia pastures in the mid 1930s (5) indicated 85 percent needed lime and 94 percent needed phosphate. The survey also indicated that 50 percent of the pastures in the state required five or more acres to pasture a 1,000-pound animal. Only 10 percent of the pastures were productive enough to carry an animal unit on two acres or less. During the period 1958 to 1970, the acreage of permanent pasture in the state decreased about 29 percent or more than 700,000 acres (10). Work on cooperator farms in West Virginia University's Allegheny Highlands Project has revealed that only about three acres are being used to produce adequate pasture for an animal unit (11). Census data indicate total livestock numbers in the state have changed little in the last 25 years (12). These two factors would suggest that pasture production per acre has increased, or perhaps utilization has improved. If pasture production or utilization has increased, the management system used to bring about the change is not well documented.

Starting in the early 1930s considerable work was designed to ascertain ways of improving pasture production in West Virginia. Odland and co-workers (4) reported the use of lime and fertilizer would greatly increase pasture production. Robinson and Pierre (7) found that top dressing unproductive pasture with lime and fertilizer increased desirable species in pastures, especially Kentucky bluegrass and white clover. At the same time weeds, poor native grasses, and bare ground were decreased. Pierre and others (5) found Kentucky bluegrass and white clover were the dominant species in West Virginia pastures when the soil was fertile. Other desirable pasture plants found were red top, timothy, Canada bluegrass, orchardgrass, hop clover, and common lespedeza. Robinson (6) found that soil properties play a major role in affecting pasture botanical composition. It has been reported (5) that under West Virginia conditions botanical composition of a pasture is a good indication of productivity.

Schaller and Pohlman (8) reported that phosphate fertilization increased the yield of permanent pasture and that the amount of phosphate applied was much more important than was the frequency of application. Jung, Balasko, and Toben (2) reported from aerial fertilization studies that fertilization increased production of nearly all of the pastures they studied, but that the response varied among soils and tended to be related to soil pH. The smallest responses observed were attributed to low clover content of swards.

More recent work (1) on permanent pastures treated according to West Virginia University standard soil test recommendations showed that most sites responded to treatment. The magnitude of response varied among soils, exposures, and past management practices.

Nestor (3) reported from a survey that different plants were found in permanent pastures than occurred in meadows or idle land. Such data suggest that grazing animals play a major role in species determination and also in pasture productivity. It is generally recognized that semiprostrate species tolerate closer grazing and persist longer under continuous close grazing than do upright growth species. However, little data have been assembled on total pasture systems and their role in affecting pasture botanical composition and productivity.

This study was undertaken to determine the botanical composition and general condition of permanent pastures in the Allegheny Highlands of West Virginia and to obtain information on grazing management systems being used on these pastures.

Procedures

Sixteen farms that entered the Allegheny Highlands Project in 1975 were chosen to be included in the survey. None of the farms had received earlier recommendations from project staff and were believed to have pastures typical of the permanent pastures in the eight-county survey area. On the 16 farms, 50 individual pastures were studied. Visits were made to the pastures twice each year, the first in summer, June or July; the second in the fall, September or October. Data were obtained on species present, contribution of each species to total sward production, ground cover, pounds of forage available for grazing, species of animal grazing the pasture, and grazing intensity.

Data on contribution of each species to total sward production, ground cover, forage available for grazing, and grazing intensity were all subjective evaluations on the part of the authors. Contribution of each species to total production was expressed as a percent of the total and was based on visual estimates. Categories used in the estimates of contribution to total production by each species were 3 percent or less, 4 to 10 percent, 11 to 25 percent, 26 to 50 percent and more than 50 percent. Ground cover was based on visual estimates using five categories, less than 75 percent, 75 to 89 percent, 90 to 94 percent, 95 to 97 percent and 98 to 100 percent. Forage available for grazing animals was expressed as pounds per acre in five categories, less than 250 lbs, 250 to 499 lbs, 500 to 999 lbs, 1,000 to 1,500 lbs, and more than 1,500. Grazing intensity was scored on a scale of 0 to 10 with 0 = no grazing animals during the season, 5 = ideal grazing, and 10 = severely overgrazed. Grazing intensity as used in this bulletin means the relationship between pasture conditions and animals on the pasture relative to a theoretical ideal. Factors such as available forage, species, site, grazing system, type of animal, season of year, and general health of the sward were considered.

The evaluations made on pastures were done independently by each author on each trip to the field and agreement reached on the scoring prior to leaving the site. In order to check the evaluation procedure, the scoring system was explained to two other West Virginia University agronomists who then scored a number of the same pastures. The evaluation scores given each pasture were not identical by the two groups but the relationship among pastures remained unchanged. Estimates of forage available for grazing animals were checked occasionally by taking clippings from the pastures. Yields as determined by the clipping measurements were usually slightly lower than the authors' estimates. The clippings did not remove as much forage as grazing animals could remove and the authors concluded that the higher visual estimates on their part were consistent with yields based on clippings. The visual estimates and clipping measurements of available forage were close enough to place the pasture into the same category relative to available forage.

Most pastures were visited each of the three years. Some farms changed ownership and others were not under similar managements each year during the survey period. Evaluations were not made when an atypical situation existed, such as when grazing animals were excluded for the season.

Results and Discussion

The fifty pastures surveyed were approximately equally distributed through eight counties in central West Virginia. A detailed description of each pasture is given in Appendix 1. The pastures were typified by wide ranges in soil series fertility level, pH, exposure, topography, and grazing management.

Species

The plant species found growing in the pastures surveyed are given in Appendix 2. More species of weeds were found than either legumes or grasses; however, grasses and legumes made up more of the forage dry matter. Overall, 13 legumes, 32 grasses and 87 weed species were recorded as being present in the fifty pastures. Of these, only 3 legumes, 15 grasses and 15 weeds were found in over 50 percent of the pasture fields at either the summer or fall observations.

During the summer the most common legume and grass species present each year were bluegrass, meadow fescue, red top, timothy, and white clover. Each of these species occurred in more than 90 percent of the pastures (Table 1). Orchardgrass and red clover were present in more than 80 percent of the pastures during the same period. In some years velvet grass, nimblewill and poverty grass were present in 80 percent of the pastures but not in all years.

In the fall only bluegrass and meadow fescue were present in 90 percent of the pastures. The other three species that occurred most frequently during the summer were still present in the fall in more than 80 percent of the pastures and were among the most common plants. Broomsedge, nimblewill, foxtail, and crabgrass were more common during fall than summer. Sweet vernal and hop clover were present in more than 50 percent of the pastures during summer in each of the three years; but in none of the years were they present in 50 percent of the pastures during the fall. Brome species and Canada bluegrass also were more common during the summer than fall but in only one year did they occur in more than 50 percent of the pastures.

Five annual legumes were found in the pastures, but hop clover was the only one that occurred in a majority of the pastures. Three of the six annual grasses found occurred in 50 percent of the pastures—crabgrass, foxtail and brome species. Nimblewill was the only warm season perennial grass that occurred in 50 percent of the pastures.

Weeds that occurred in more than 50 percent of the pastures are given in Table 2. Buckhorn plantain, thistle and wild carrot were found in more pastures during summer and fall than any of the other weeds. During the summer, daisy

Table 1

Grasses and legumes that occurred in 50 percent or more of the pastures surveyed in 1975 (★), 1976 (x), and 1977 (#).

Species	Frequency of Occurrence in Summer (%)					Frequency of Occurrence in Fall (%)				
	50-59	60-69	70-79	80-89	90+	50-59	60-69	70-79	80-89	90+
Bluegrass					★x#					★x#
Brome species	★									
Broomsedge		#	★x					#	★x	
Canada bluegrass			#							
Crabgrass		#					#	x		
Foxtails							★x#			
Hop clover	x	★	#							
Meadow fescue					★x#					★x#
Nimblewill			★#	x				x	#	★
Orchardgrass				★ #	x				x#	★
Panicums	x#					★				
Poverty grass		★	x	#			★	x#		
Red clover				★ #	x				★x#	
Red top					★x#				★x#	
Sweet vernal	#	★	x							
Timothy					★x#				x#	★
Velvet grass	#	x		★		x#	★			
White clover					★x#				x#	★

was present in more than 50 percent of the pastures each year, but was not found very frequently during the fall. Aster was rarely found during the summer period but was present in more than 60 percent of the pastures each year during the fall.

Forage Available for Grazing

The forage available for grazing averaged 1,050 lbs per acre in pasture in the summer of 1975, 500 in 1976 and 375 in 1977. The amount of forage available was always more in the summer than during the fall. Some pastures had as little as 75 lbs per acre and others had as much as 2,500 lbs per acre. During the three-year study period the forage available for grazing animals decreased each year. This was probably a reflection of forage production as influenced by weather conditions and not a change in livestock numbers. Good growing conditions for pasture production existed in 1975. The spring of 1976 was dry and production was less than in normal years. The reduced production in combination with the same number of animals resulted in less forage available for grazing. The low production during the spring resulted in pastures not getting a good start in 1976. By fall, the pastures were short and many plants entered the winter in a less than desirable condition.

During the fall of 1975, 625 lbs of forage were available for grazing at the end of the grazing season, whereas only 375 and 300 lbs were available at the end of 1976 and 1977, respectively. In 1977, nearly half of the pastures had 200 lbs or less available for grazing. These pastures were probably not providing adequate forage for good animal performance at this time.

Grazing Intensity

In an effort to assess grazing intensity each pasture was scored relative to a theoretical ideal situation. Using such a system resulted in pastures in 1975 being scored as slightly undergrazed and overgrazed in 1977. Individual pastures in each year ranged from being severely overgrazed to severely undergrazed.

The species present, especially crabgrass, were in part related to grazing intensity. Pastures that were scored as being overgrazed nearly always had crabgrass present and the amount of crabgrass increased as grazing intensity increased (r = .41). Thus it would seem from this study that crabgrass is a good species to indicate grazing intensity. This is probably related to open sod and a place for seedlings to become established. Further indication of this occurring was the increased presence of annual weeds such as ragweed in overgrazed pastures.

Ground Cover

Ground cover was estimated from visual observations and was found to be about the same in summer and fall. Ground cover was slightly less in 1977 than in the earlier two years but in each year was in the 90-95 percent range. Ground cover was correlated with grazing intensity and forage available for grazing (Table 3). These correlation values would probably have been higher had it not been for variation in species present. Pastures that were overgrazed and had little forage available for grazing nearly always had poor ground cover. Ground cover was frequently poor in pastures that contained tall growing bunch grasses although the pastures were not overgrazed and considerable forage was available for grazing. This type of pasture occurred most frequently on sites with shallow soils and/or low fertility. The most common species on such

Table 2

Weeds that occurred in 50% or more of the pastures surveyed in 1975 (★), 1976 (x), and 1977 (#).

	Frequency of Occurrence in Summer (%)					Frequency of Occurrence in Fall (%)				
Species	50-59	60-69	70-79	80-89	90+	50-59	60-69	70-79	80-89	90+
Aster							★x	#		
Broadleaf plantain	#									
Buckhorn plantain		★		x	#			★x#		
Cinquefoil	#	x								
Daisy	★		x#							
Dandelion	#					#				
Field basil	#	x								
Healall		x	#			x				
Horsenettle	x#					#				
Iron weed						★				
Oxalis		x	#							
Ragweed	x		#			★	#			
Thistle				x#					x	★ #
Wild carrot				x#						★x#
Yarrow			x	#						

Table 3

Correlations among characters used to describe permanent pasture conditions.

	Summer			Fall		
Characters	1975	1976	1977	1975	1976	1977
Grazing intensity × ground cover	-.31*	-.41**	-.66**	-.30*	-.62**	-.64**
Grazing intensity × available forage	-.75**	-.86**	-.87**	-.82**	-.54**	-.84**
Available forage × ground cover	+.42**	+.36*	+.66**	+.40**	+.26	+.67**

*Significant at the .05 level. **Significant at the .01 level.

pastures was broomsedge, but considerable amounts of poverty grass and some annual weeds occurred frequently.

There was a definite trend for the least bare ground to be associated with pastures that were neither overgrazed nor undergrazed and which usually had higher than average fertility. Such pastures were usually dominated by bluegrass, white clover, red top and other species that either tend to form sods or ones that do not have tall upright growth habits.

Correlation values are shown in Table 3 among ground cover, forage available for grazing, and grazing intensity. There was no difference in correlation values in summer and fall. Correlation was higher between grazing intensity and available forage than for any of the other comparisons.

Contribution to Production by Various Species

The contribution of selected grasses and legumes to total sward production is shown in Table 4. Broomsedge, red top and white clover were the only species that comprised more than 50 percent of the total forage available in any pasture during the summer. In the fall, crabgrass, nimblewill and orchardgrass as well as broomsedge and red top comprised more than 50 percent of the forage in certain pastures. Species that comprised more than 25 percent of the forage available for grazing in several pastures in the summer period were bluegrass, broomsedge, meadow fescue, orchardgrass, red top, and white clover. In the

Table 4

Contribution of selected grasses and legumes as a percent of total sward production (1975-77 average)

	Contribution in Summer (%)					Contribution in Fall (%)				
Species	≤ 3	4-10	11-25	26-50	≥51	≤ 3	4-10	11-25	26-50	≥ 51
Bluegrass	39	32	23	7	0	30	33	25	11	0
Brome species	90	10	0	0	0	91	9	0	0	0
Broomsedge	60	13	16	7	3	53	23	13	7	4
Canada bluegrass	85	15	0	0	0	90	10	0	0	0
Crabgrass	66	21	13	0	0	60	23	13	4	1
Foxtails	86	14	0	0	0	70	23	7	0	0
Hop clover	90	9	1	0	0	100	0	0	0	0
Meadow fescue	42	37	17	4	0	40	31	21	8	0
Nimblewill	76	16	8	0	0	46	26	20	5	3
Orchardgrass	45	22	19	15	0	48	26	17	7	1
Panicums	84	16	0	0	0	82	16	2	0	0
Poverty grass	59	28	12	2	0	70	17	10	1	0
Red clover	77	17	3	3	0	69	27	3	1	0
Red top	39	28	16	16	2	31	32	20	15	3
Sweet vernal	76	23	0	1	0	87	9	4	0	0
Timothy	41	45	15	1	0	68	27	5	0	0
Velvet grass	61	26	11	1	0	70	22	9	0	0
White clover	48	26	19	6	1	58	25	13	5	0

fall these same species were again the species that most frequently made up 25 percent or more of the available forage, although crabgrass and nimblewill greatly increased in importance as a source of forage.

Eleven warm season grasses occurred in the fifty pastures, but broomsedge and nimblewill were the only ones that constituted more than 3 percent of the total forage produced in any of the pastures. Canada bluegrass and hop clover rarely made up 3 percent of the total forage although they were frequently present.

The most common type of pasture found was one with a large number of species. In situations where few species existed extremes tended to exist in fertility or management. Very low fertility, especially low pH, (pastures 35 and 36) or very high fertility (pasture 39) tended to be situations in which fewer species and sometimes near monocultures tended to exist although the species were not the same at the two extremes. Grazing intensity, like fertility, influenced number of species contributing significantly to available forage. Pastures that were lightly grazed or heavily grazed tended more toward monocultures than those with intermediate grazing intensity. Pastures with intermediate fertility and grazing intensity frequently had eight or more species that were contributing significantly to available forage.

White clover was the most common legume present in the pastures and was also the legume which contributed most to available forage. This species appeared to be a good indication of pasture production and perhaps a better indicator of overall pasture condition than any other species. Pastures number 29 and 34 (Appendix 1) were the only pastures of those studied that had more than 25 percent white clover each of the three years during both summer and fall. From data collected no explanation is evident as to why there should be more clover in these two pastures other than as influenced by grazing management. Both pastures had in excess of 300 lbs available potassium, medium phosphorus values, and were grazed either by sheep alone or sheep in combination with cattle. Both pastures had heavy sod cover and had grazing intensity considered to be ideal or slightly heavier than ideal by the authors. Both pastures were at high elevation in Pocahontas County where rainfall distribution and temperatures were favorable for pasture production.

Relationship Between Soil Test Results and Species Production

Simple correlation coefficients between selected soil test results (pH, P, and K) and forage produced by particular grasses and legumes were determined. Significant correlation coefficients ($P<.05$) are given in Table 5. In general, correlations were not high. As pH decreased poverty grass production increased and red clover and timothy production decreased. None of the other species was related to pH in a consistent manner. Phosphorus and potassium were positively correlated with bluegrass and orchardgrass production, and were negatively correlated with those species commonly found in less productive pastures such as broomsedge, poverty grass, red top, and velvet grass.

It would seem that the contribution of a particular species to forage production is a more complicated situation than pH and/or fertility. Other factors or combinations of factors may influence individual species performance such that soil test results appear to be of little importance; however, this is not to suggest that soil fertility is not important but rather that other factors of management also are important.

Table 5

Simple correlation coefficients between selected soil test results and forage produced by particular pasture species

Pasture Species	Soil Test Results		
	pH	P	K
Bluegrass	*	+.44	+.57
Broomsedge	*	-.43	-.50
Crabgrass	*	*	*
Meadow fescue	*	*	*
Nimblewill	*	-.30	*
Orchardgrass	*	+.48	+.52
Poverty grass	-.35	-.45	-.35
Red clover	+.29	*	*
Red top	*	-.34	-.43
Timothy	+.35	*	*
Velvet grass	*	-.37	-.40
White clover	*	*	*

Changes In Fertility and Pasture Species

Soil test results were higher in this study than those reported by Pierre and others (5). These earlier workers found 85 percent of the pastures in the state needed lime, whereas only 40 percent of the pastures in this study had pH values below 6.0. Only 20 percent of the pastures had phosphorus values below 25 lbs per acre and 38 percent had values of 50 lbs or higher, which at the present time is considered high by West Virginia University Soil Test Standards. By comparison, earlier work indicated only 6 percent of the pastures had adequate phosphorus.

The above data seem to indicate that fertility of West Virginia pastures has increased. However, the study reported here mostly reflects the highlands area of the state which may be different from the state as a whole. It also should be remembered that in the last thirty years considerable acreage has gone out of pasture production and it seems reasonable to assume that the lower fertility pastures would be the most likely ones to have reverted to forest. It also is possible that pasture treatment has increased through aerial fertilization and other programs.

Although fertility levels were higher in this study than in earlier reports the species found in pastures were similar to those reported earlier. Major difference would appear to be possible increases in orchardgrass and meadow fescue and possible decreases in Canada bluegrass and lespedeza. The changes could be related to fertility or location within the state. Red top, timothy, bluegrass, white clover, and hop clover were reported as common in pastures earlier and were found to have remained among the most common species.

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APPENDIXES

Appendix 1

Location, soil fertility, grazing management, topography, and exposure of pastures surveyed

Pasture Number	County	Soil Series	pH	P	K	Ca	Mg
1	Harrison	Gilpin-Upshur	6.9	26	409	9400	420
2	Harrison	Gilpin-Upshur	5.6	40	293	3000	555
3	Harrison	Gilpin-Upshur	6.2	56	396	4800	1125
4	Harrison	Gilpin-Upshur	6.1	81	338	3400	825
5	Harrison	Gilpin-Upshur	6.1	78	560	4800	720
6	Harrison	Gilpin-Upshur	6.1	126	403	5700	525
7	Harrison	Gilpin-Upshur	6.9	135	435	8500	1155
8	Lewis	Gilpin-Upshur	7.1	63	234	15000	330
9	Lewis	Gilpin-Upshur	5.6	20	320	3100	285
10	Lewis	Gilpin-Upshur	5.8	68	309	3500	495
11	Lewis	Gilpin-Upshur	5.8	23	273	3500	300
12	Lewis	Gilpin-Upshur	7.2	31	195	14800	240
13	Upshur	Gilpin-Upshur	5.3	19	273	2100	210
14	Upshur	Gilpin-Upshur	5.5	29	338	2900	585
15	Upshur	Gilpin-Upshur	5.4	84	283	2500	240
16	Upshur	Reclaimed strip mine	7.5	199	263	5900	585
17	Barbour	Gilpin-Upshur	5.8	31	160	2900	105
18	Barbour	Gilpin-Upshur	5.6	24	229	2200	255
19	Barbour	Gilpin-Upshur	6.8	40	253	4200	540
20	Barbour	Gilpin-Upshur	6.0	31	184	2900	390
21	Barbour	Gilpin-Upshur	5.1	15	258	1800	195
22	Barbour	Gilpin-Upshur	5.8	26	263	3800	240
23	Barbour	Gilpin-Upshur	7.4	21	188	9800	150
24	Randolph	Berks-Weikert	6.8	46	248	6200	285
25	Randolph	Berks-Weikert	7.0	44	174	9500	105
26	Randolph	Alluvial land	7.0	40	333	5500	270

27	Randolph	Lickdale	6.7	46	160	4400	1005
28	Randolph	Philo	7.1	75	195	6100	210
29	Pocahontas	Camp	5.6	44	320	2500	195
30	Pocahontas	Teas	5.6	60	415	3000	270
31	Pocahontas	Frederick	5.5	19	248	2800	165
32	Pochahontas	Dekalb-Berks	6.1	26	244	5000	225
33	Pocahontas	Dekalb-Berks	6.4	94	293	5100	225
34	Pocahontas	Belmont	5.3	36	344	2900	225
35	Pocahontas	Teas	4.9	26	239	2900	240
36	Pocahontas	Calvin	4.8	16	181	900	105
37	Pendleton	Berks	6.8	229	441	5100	480
38	Pendleton	Opequon	6.2	86	506	4200	855
39	Pendleton	Lindside	6.3	368	882	6100	540
40	Pendleton	Weikert	6.0	43	326	4600	240
41	Pendleton	Litz	6.1	84	461	5200	300
42	Pendleton	Litz	6.2	63	309	6200	270
43	Pendleton	Litz	6.6	40	273	5300	165
44	Pendleton	Litz	6.5	100	441	6600	315
45	Tucker	Belmont	5.5	19	258	2800	120
46	Tucker	Belmont	5.4	24	344	2700	195
47	Tucker	Belmont	6.3	33	234	5600	135
48	Tucker	Belmont	5.4	23	143	2600	90
49	Tucker	Belmont	6.3	90	273	6900	255
50	Tucker	Calvin	6.2	44	214	4900	135

(continued)

Appendix 1 (continued)

Location, soil fertility, grazing management, topography, and exposure of pastures surveyed

Pasture Number	Animal Species*	Grazing System**	Avg. Slope	Equipment Access***	Exposure****
1	C (bulls)	C	25-30	65	NW
2	C	R	35-40	35	NW
3	C	R	25-30	70	N
4	C	R	20-25	65	W
5	C	R	15-20	90	S
6	C	R	25-30	55	E
7	C	R	15-20	100	SE
8	C	C	15-20	60	S
9	C	C	35-40	50	N
10	C	C	35-40	50	N
11	C (steers)	C	25-30	80	E
12	C (steers)	C	30-35	65	NW
13	C + S	C	15-20	95	E
14	C + S	C	30-35	50	W
15	C	C	30-35	25	N
16	C	C	5-10	90	A
17	C	C	0-5	95	A
18	C	C	0-5	100	A
19	C	C	25-30	90	E
20	C	C	10-15	90	W
21	C	C	40-45	15	N
22	C	C	25-30	90	S
23	C	C	5-10	100	A

24	C	C	25-30	90	S
25	C	C	30-35	50	E
26	C	C	0-5	90	A
27	C	C	0-5	85	NE
28	C	C	5-10	100	N
29	C + S	C	5-10	90	S
30	C + S	C	10-15	95	W
31	C	R	35-40	20	N
32	C + S	C	35-40	20	W
33	C	R	0-5	95	A
34	S	C	15-20	95	SE
35	S	C	35-40	20	S
36	S	C	40-45	5	S
37	C	R	10-15	100	S
38	C	C	30-35	50	SE
39	C	C	5-10	100	E
40	C + S	C	40-45	15	E
41	S	C	45-50	15	W
42	C + S	C	45-50	15	N
43	C + S	C	40-45	20	NW
44	C + S	C	25-30	70	S
45	C	C	30-35	10	SE
46	C	R	40-45	20	NE
47	C	R	20-25	50	E
48	C	R	35-40	0	N
49	C	C	20-25	50	W
50	C	C	30-35	50	NW

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*C indicates beef cows and calves unless otherwise noted. S indicates ewes and lambs.

**C indicates continuous and R indicates rotational.

***Equipment access refers to the percent of the pasture that could be treated with conventional ground equipment.

****Exposure A = all; S = south; E = east; N = north and W = west

Appendix 2

Common and scientific names of legumes, grasses, and weeds in permanent pastures in the Allegheny Highlands

Legumes

Common Name	**Scientific Name**
alfalfa	*Medicago sativa* L.
alsike clover	*Trifolium hybridum* L.
black medic	*Medicago lupulina* L.
birdsfoot trefoil	*Lotus corniculatus* L.
hop clover	*Trifolium agrarium* L. and *T. campestre* Schreber
Japanese bushclover	*Lespedeza striata*
Korean lespedeza	*Lespedeza stipulacea* Maxim
Lespedeza sp.	Lespedeza sp.
red clover	*Trifolium pratense* L.
sericea lespedeza	*Lespedeza cuneata* (Dumont) G. Don
sweet clover	Melilotus sp.
white clover	*Trifolium repens* L.
rabbits-foot-clover	*Trifolium arvense* L.
Grasses	
Agrostis species	*Agrostis* sp.
barnyardgrass	*Echinochloa crusgalli* (L.) Beauv.
big bluestem	*Andropgon gerardi* Vitman
bluegrass	*Poa pratensis* L.*
brome sp.	*Bromus* sp.
broomsedge	*Andropogon virginicus* L.
Canada bluegrass	*Poa compressa* L.
crabgrass	*Digitaria sanguinalis* (L.) Scop.
deertongue	*Panicum clandestinum* L.
dropseed	*Sporobolus vaginiflorus* (Torr.) Wood
flat-stemmed panicgrass	*Panicum anceps* Michx.
foxtails	*Setaria* sp.
goosegrass	*Eleusine indica* (L.) Gaertn.
hairy paspalum	*Paspalum pubescens* Muhl.
Indiangrass	*Sorghastrum nutans* (L.) Nash
little bluestem	*Andropogon scoparius* Michx
meadow fescue	*Festuca elatior* L.
nimblewill	*Muhlenbergia schreberi* J.F. Gmel.
orchardgrass	*Dactylis glomerata* L.
panicums	*Panicum* sp.
poverty grass	*Danthonia spicata* (L.) Beauv.
purple lovegrass	*Eragrostis spectabilis* (Pursh) Steud.

*Includes other species such as *Poa cuspidata* which were not separated for evaluation.

Appendix 2 (continued)

Common Name	**Scientific Name**
purpletop	*Triodia flava* f. cuprea (Jacq.) Fosberg
quackgrass	*Agropyron repens* (L.) Beauv.
red fescue	*Festuca rubra* L.
red top	*Agrostis alba* L.
ryegrass	*Lolium* sp.
smoothbrome grass	*Bromus inermis* Leyss.
sweet vernal	*Anthoxanthum odoratum* L.
tall fescue	*Festuca arundinacea* Schreb.
tall meadow oatgrass	*Arrhenatherum elatius* (L.) Mert. & Koch.
timothy	*Phleum pratense* L.
velvet grass	*Holcus lanatus* L.
Weeds	
aster	*Solanum* sp.
bedstraw	*Galium* sp.
bindweed	*Convolvulus* sp.
blackberry	*Rubus* sp.
black-eyed susan	*Rudbeckia hirta* L.
blue-eyed grass	*Sisyrinchium* sp.
blue thistle	*Echium vulgare* L.
boneset	*Eupatorium perfoliatum* L.
bracted plantain	*Plantago aristata* Michx.
buckhorn plantain	*Plantago lanceolata*
buttercup	*Ranunculus* sp.
butterfly weed	*Asclepias tuberosa* L.
catnip	*Nepeta cataria* L.
cat's ear	*Hypochoeris radicata* L.
chicweed	*Cerastium vulgatum* L.
chicory	*Cichorium intybus* L.
cinquefoil	*Potentilla simplex* Michx.
clubmosses	*Lycopodium* sp.
colts foot	*Tussilago farfara* L.
common burdock	*Arctium minus* (Hill) Bernh.
common dandelion	*Taraxacum officinale* Weber.
common mallow	*Malva neglecta* Wallr.
common milkweed	*Asclepias syriaca* L.
common plantain	*Plantago rugelii* Dcne.
common ragweed	*Ambrosia artemisifolia* L.
common smartweed	*Polygonum hydropiper* L.
cudweed	*Gnaphalium obtusifolium* L.
curly dock	*Rumex crispus* L.
daisy	*Chrysanthemum leucanthemum* L.
daisy fleabane	*Erigeron strigosus* Muhl.

(continued)

Appendix 2—Weeds (continued)

Common Name	Scientific Name
dense-flowered peppergrass	*Lepidium densiflorum* Schrod.
deptford pink	*Dianthus armeria* L.
dewberries	*Rubus* sp.
elephant's-foot	*Elephantopus carolinianus* Willd.
ferns	*Polypodiaceae* family
field basil	*Satureja vulgaris* (L.) Fritsch
galinsoga	*Galinsoga ciliata* (Raf.) Blake
golden ragwort	*Senecio aureus* L.
goldenrod	*Solidago* sp.
great mullein	*Verbascum thapsus* L.
greenbrier	*Smilax* sp.
ground cherry	*Physalis heterophylla* Nees
ground ivy	*Glechoma hederacea* L.
groundpine	*Lycopodium flabelliforme* Blanchard
hawkweed	*Hieracium* sp.
heal-all	*Prunella vulgaris* L.
hedge mustard	*Sisymbrium officinale* (L.) Scop.
horse-nettle	*Solanum carolinense* L.
hounds-tongue	*Cynoglossum officenale* L.
Indian hemp	*Apocynum cannabinum* L.
Indian tobacco	*Lobelia inflata* L.
iron weed	*Vernonia* sp.
Joe-pye weed	*Eupatorium fistulosum* Barratt
knotweed	*Polygonum aviculare* L.
lobelia	*Lobelia* sp.
May-apple	*Podophyllum peltatum* L.
mistflower	*Eupatorium coelestinum* L.
morning-glory	*Ipomoea* sp.
night shade	*Solanum* sp.
nutsedge	*Cyperus esculentus* L.
path rush	*Juncus tenuis* Willd.
pennywart	*Obolaria virginica* L.
pigweed	*Amaranthus hybridus* L.
pokeweed	*Phytolacca americana* L.
purple goat's beard	*Tragopogon porrifolius* L.
red sorrel	*Rumex acetosella* L.
sedges	*Carex* family
shepherd's purse	*Capsella bursa-pastoris* (L.) Medic.
small flowered agrimony	*Agromonia parviflora* Ait.
smooth-body cocklebur	*Xanthium pensylvanicum* Wall.
spanish needles	*Bidens bipinnata* L.
stitchwort	*Stellaria graminea* L.
St. John's Wort	*Hypericum* sp.
strawberry	*Fragaria virginiana* Duchesne
thistle	*Cirsium* sp.
three-seeded mercury	*Lycopodium flabelliforme* Blanchard

Appendix 2—Weeds (continued)

Common Name	**Scientific Name**
tumble mustard	*Sisymbrium altissimum* L.
velvetleaf	*Abutilon theophrasti* Medic.
Venus' looking glass	*Specularia perfoliata* (L.) A. DC.
violets	*Viola* sp.
whitehaired leatherflower	*Clematis albicoma* Wherry
white-top	*Erigeron annuus* (L.) Pers
wild carrot	*Daucus carota* L.
wild onion	*Allium cernuum* Roth
wild roses	*Rosa* sp.
wood sorrel	*Oxalis* sp.
yarrow	*Achillea millefolium* L.

Summary

Information obtained in this study indicates that pastures in the Allegheny Highlands of West Virginia are variable in botanical composition and that many factors go into determining pasture production and qualilty. The following statements serve as general descriptions.

1. Most of the pastures consisted of many species. No single species accounted for as much as half of the total forage being produced in permanent pastures.

2. The most common forage species present in pastures were bluegrass, meadow fescue, red top, timothy, and white clover. The most common weeds were buckhorn plantain, thistle, and wild carrot.

3. The amount of forage available for grazing animals decreased during the grazing season and by the end of the grazing season most pastures had little forage available for grazing.

4. Grazing intensity was greatly determined by weather conditions. In good growing seasons many pastures were undergrazed and few were overgrazed. In seasons when conditions were not favorable for production many pastures were overgrazed.

5. Ground cover was closely associated with the type of plant species which was influenced by grazing intensity and fertility. Pastures with the best ground cover had intermediate fertility and grazing intensity.

6. Broomsedge, red top, crabgrass, nimblewill, orchardgrass, and white clover were species found to make up 50 percent or more of the forage in some pastures.

7. Pastures which consistently had 25 percent or more white clover appeared as the most productive pastures. These pastures had high soil potassium values and were grazed closely by sheep or a combination of cattle and sheep.

8. Correlation coefficients indicated that as soil pH decreased the production of poverty grass increased. As soil phosphorus or potassium increased, orchardgrass and bluegrass production increased; and broomesedge, poverty grass, red top, and velvet grass production decreased.

9. Some evidence indicates that pasture fertility may have increased during the last four decades, but, in general, botanical composition of pastures has changed little except for some increase in orchardgrass and meadow fescue and a decrease in Canada bluegrass and common lespedeza.